

**Tuttle Creek Lake
Interstate Targeted Watersheds Grant Project Proposal**

**Using Watershed Partnerships and Market-Based Incentives
to Reduce Sediment, Nutrient, Herbicide, and Bacteria Loads
in a Large Agricultural Watershed**

**A Cooperative Proposal By Tuttle Creek Lake Watershed Partners in
Nebraska And Kansas – May 2005**

**8-Digit Hydrologic Unit Codes: 10270202, 10270204, 10270206, 10270207
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ABSTRACT

The Tuttle Creek Lake Interstate Targeted Watersheds Grant Project is a collaborative effort between Nebraska and Kansas to address multi-jurisdictional water quality problems involving excessive runoff of sediment, nutrients, herbicides, and bacteria. Tuttle Creek Lake is a major source of water (up to 50 percent of the flow) for the Kansas River, which supplies public drinking water for the urban populations of Kansas City, Topeka, and Lawrence. Tuttle Creek Lake is listed on the Kansas Section 303(d) list as impaired for sedimentation, eutrophication, atrazine, and alachlor.

This project will build upon existing watershed partnerships to integrate funding sources from Farm Bill, Clean Water Act, state, and local conservation programs in implementing existing local watershed plans and total maximum daily load plans. Project goals have been linked to the goals of individual watershed plans. A unique, voluntary, market-based approach for landowner adoption of best management practices will be implemented.

TUTTLE CREEK LAKE INTERSTATE TARGETED WATERSHEDS GRANT PROJECT PROPOSAL

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INTRODUCTION

Tuttle Creek Lake is a 14,000 acre impoundment located in northeast Kansas at the lower end of the Big Blue River (Figure 1, Appendix C). The watershed consists of a total area of 9,628 square miles with about three-fourths of the drainage area in Nebraska and the remainder in Kansas. The U.S. Army Corps of Engineers (USACE) built the lake in 1962 for flood control, irrigation, water supply, recreation, fish and wildlife management, low flow augmentation, and navigation flow supplementation. The original conservation pool and maximum storage capacities of the reservoir were 425,000 acre-ft and 2,346,000 acre-ft, respectively. Outflow from Tuttle Creek Lake enters the Big Blue River about nine miles above its confluence with the Smoky Hill and Republican rivers near Manhattan, Kansas, where the three rivers join to form the Kansas River. Tuttle Creek Lake is a major source of water (up to 50 percent of the flow) for the Kansas River, which supplies public drinking water for the urban populations of Kansas City, Topeka, and Lawrence.

The project area is comprised of hydrologic unit codes (HUCs) 10270202, 10270204, 10270205, and 10270207 (Figure 2, Appendix C). The primary tributaries to Tuttle Creek Lake are the Big Blue River, Little Blue River, and Black Vermillion River. Major secondary tributaries in the project area include Rose Creek and Mill Creek in the Little Blue River Basin; and Turkey Creek, Swan Creek, Cub Creek, and Big Indian Creek in the Big Blue River Basin (Figure 3, Appendix C).

Land use within the Tuttle Creek Lake Watershed is primarily agricultural, with approximately 72% of the land area in corn, grain sorghum or other crops, 10% in pastureland, and 10% in woodland. Herbicides are used extensively to control agricultural weeds throughout the watershed.

The long-term mean annual precipitation in the watershed is 32 inches (81 cm) with most of the precipitation falling between April and September. The topography of the project area is highly dissected with slopes ranging from 1% to greater than 10%. In general, the north and western portions of the Big and Little Blue River Basins are relatively flat, with slopes typically less than 3 percent. In the remainder of the basin, extensive dissection results in slopes that generally exceed 10 percent. The predominate soil types within the watershed are silty clay loams. Soil infiltration rates in the project area range from moderate to very slow. Therefore, most soils have a moderate to very high potential of transporting contaminants to surface waters; either in solution, or bound to eroded soil particles.

Natural resource assessment maps of the project area (Figures 13-16, Appendix D) were used in conjunction with assessment of empirical surface water quality data (Appendix E) to identify and target the critical four-county area of nonpoint source runoff near the Nebraska-Kansas State Line (Figure 4, Appendix C) and subwatersheds with highly erodable lands and failing best management practices (BMPs) such as the Swan Creek Lake (5A) Watershed (Figure 5, Appendix C).

WATER QUALITY PROBLEMS

Tuttle Creek Lake is listed on the Kansas Section 303(d) list as impaired for siltation, eutrophication, atrazine, and alachlor due primarily to runoff from cultivated

cropland. Extremely high suspended solids and nutrient loads enter the reservoir during storm events and excessive siltation has occurred in the upper third of the original conservation pool reducing its volume by approximately 30% (Figure 6, Appendix C). The reservoir also has consistently high levels of total phosphorus that average 185 parts per billion (ppb) at the deep-water site, which has contributed to the eutrophication of the lake. Total phosphorus levels in the primary tributaries to Tuttle Creek Lake (Figure 3, Appendix C) are extremely high and include the following average concentrations: Little Blue River, 522 ppb; Big Blue River, 753 ppb; and Black Vermillion River, 320 ppb.

Herbicide studies have shown heavy herbicide loadings during storm-water runoff events into Tuttle Creek Lake. These elevated herbicide levels pose a risk to potable water supply benefits downstream of the lake in the Kansas River. Atrazine concentrations in the impoundment during the period of record show many periods when the public drinking water and aquatic life criterion of 3 ug/L has been exceeded.

Other impaired reservoirs and stream segments in the project area, listed with their contaminants of concern, are Swan Creek Lake (5A) located in Saline County, Nebraska (atrazine, nutrients, pH); the Big Blue River and Little Blue River in Nebraska and Kansas (fecal coliform or E. coli bacteria); and Horseshoe Creek and the Black Vermillion River in Kansas (fecal coliform bacteria). The primary source of bacteria in the Tuttle Creek Lake Watershed is believed to be livestock waste.

PROJECT DESCRIPTION

The Tuttle Creek Lake Interstate Targeted Watersheds Grant Project is a collaborative effort between the states of Nebraska and Kansas to address multi-

jurisdictional water quality problems involving excessive runoff of sediment, nutrients, herbicides, and bacteria.

Broad Support

This project will build upon existing watershed partnerships in Nebraska and Kansas involving a wide variety of agencies and organizations (Appendix G), which have been working together for many years through an interstate water quality committee, established under provisions of the Big Blue River Compact of Nebraska and Kansas, to coordinate monitoring, educational outreach, promote installation of BMPs, and improve water quality in the Big Blue River Basin. With the development of the Tuttle Creek Lake TMDLs, the goals for reducing sediment, nutrient, atrazine, and alachlor runoff into Tuttle Creek Lake have been established and funding is needed to implement priority BMPs. Targeted Watersheds Grant (TWG) funds will be used in conjunction with other Clean Water Act, Farm Bill, state, and local program funds to implement the goals of this project, which mirror the goals of existing watershed management plans and total maximum daily load plans (see references in Appendix E) in the Big Blue River Basin.

Market-Based Incentives

A unique, voluntary, market-based approach for landowner adoption of BMPs will be used in implementing these plans, which will allow landowners to “name their own price” and negotiate for the levels of rental, incentive, and maintenance payments and cost-share assistance they will require in order to adopt conservative practices on their land. TWG funds will be used to provide incentive payments in conjunction with existing conservation programs of the Natural Resources Conservation Service (NRCS), Natural Resources Districts (NRDs) in Nebraska, Watershed Districts in Kansas, and

other state and local programs to the maximum extent possible; however, some conservation practices will be funded entirely with TWG funds. Incentive payments and cost-share assistance will also be offered to landowners for planting specialty forest products such as fruit and nut trees, woody decorative florals, and plants used in food and herbal health supplements (see University of Nebraska-Lincoln references in Appendix E) in riparian buffer strips to provide landowners with opportunities for future supplemental income. Limited grazing and haying benefits will also be offered to landowners who install riparian buffer strips through state buffer strip programs or entirely with TWG funds. If implemented properly, limited haying and grazing practices can actually improve the condition and function of riparian buffer strips. Without significant landowner participation in the critical four-county area (Appendix D) of the Tuttle Creek Lake Watershed, the success of this project will be limited. Therefore, these market-based incentives will be used to increase landowner adoption of BMPs where they are most needed to reduce soil erosion and runoff of nutrients, herbicides, and bacteria.

Landowners within the project area will be contacted and receive assistance in adopting conservative practices from members of the Nebraska and Kansas project management regional teams (Appendix B). The Lower Big Blue and Little Blue NRDs in Nebraska will hire a watershed coordinator (preferably a retired NRCS employee) to meet one-on-one with landowners and promote and certify adoption of BMPs in Nebraska. An existing Watershed Specialist position with KSU will conduct similar duties in Kansas. These watershed positions will also conduct resource inventories of

landowners at the end of the 3-year project period to evaluate progress made in reducing use of nutrients and herbicides, and installing BMPs.

High priority conservation practices that will be funded by this project include: (1) Implementing continuous no-till farming systems; (2) Installing riparian buffer strips; (3) Developing nutrient and herbicide management plans for individual farms; (4) Restoring riparian wetlands; (5) Reconditioning existing conservation practices such as riparian buffer strips, terraces, tile outlets, and grassed waterways; (6) Installing streambank stabilization practices; (7) Installing fencing, alternative off-stream watering sites, portable shelters, and stabilized stream watering points for livestock; and (8) Planting specialty forest products in riparian buffer strips.

The installation of as many acres of continuous no-till farming systems as possible in the four-county critical area will be a top priority. Continuous no-till systems are one of the most cost-effective methods of reducing sediment, nutrient, pesticide, and bacteria runoff. Installation of riparian buffer strips along small and medium-sized streams in the four-county priority area will also be emphasized. Riparian buffer strips have trapping efficiencies of up to 90% for pollutants such as sediment, nutrients, herbicides, and bacteria, and will be used in tandem with the no-till systems as the top two BMP priorities for addressing identified water quality problems in the watershed. Landowner contracts will generally have terms of five to 10 years, or more, so incentive payments for the entire contract term will be paid to landowners within the three-year project period. NRCS practices will be followed for all conservation practices to achieve maximum water quality benefits.

A total of \$300,000 in nonfederal matching funds has been allocated for this project. A corresponding federal Targeted Watersheds Grant of \$900,000 is being requested by this project proposal for a total project cost of \$1,200,000 (Appendix A) with nonfederal matching funds representing 25% of the total. This project will extend from October 1, 2005, until September 30, 2008.

PROJECT GOALS:

Project goals are linked to the goals of individual watershed plans and TMDL plans within the Tuttle Creek Lake watershed. Because the number of landowners participating in each of these cost-share programs is unknown, the listed goals represent maximum estimated levels of participation, and thus, sufficient funding will not be available to achieve all of the listed goals. This project will attempt to achieve the following goals within the three-year grant period: (1) Reduce the average sediment “delivery” rate to Tuttle Creek Lake in tons per acre by 25 percent from 0.67 tons per acre to 0.50 tons per acre within the project area. If successful, the annual volume loss in Tuttle Creek Lake would be reduced by 249 acre-feet per year; (2) Reduce the average total phosphorus “delivery” rate to Tuttle Creek Lake by 20 percent from 3.11 pounds per acre to 2.49 pounds per acre and reduce annual total phosphorus loading to Tuttle Creek Lake by 638 tons per year; (3) Reduce atrazine and alachlor concentrations in Tuttle Creek Lake to levels below the public drinking water criteria of 3 ppb and 2 ppb, respectively, and if successful, remove Tuttle Creek Lake from the Section 303(d) list of impaired waters for atrazine and alachlor; (4) Provide cost-share assistance and rental, incentive, and maintenance payments for up to 50 landowners for installation of no-till cropping systems; (5) Provide cost-share assistance and rental, incentive, and

maintenance payments to landowners for installation of up to 1,000 additional linear miles of riparian buffer strips; (6) Develop nutrient and herbicide management plans for up to 25 individual farms or ranches; (7) Provide cost-share assistance and rental, incentive, and maintenance payments to landowners for restoration of up to 25 riparian wetlands in the 100-year floodplain of streams; (8) Provide maintenance payments for up to 25 landowners for reconditioning of existing conservation practices such as riparian buffer strips, terraces, tile outlets, and grassed waterways; (9) Provide cost-share assistance for up to 25 landowners for installation of streambank stabilization practices; (10) Provide cost-share assistance for up to 25 landowners for installation of fencing, alternative off-stream watering sites, portable shelters, or stabilized stream watering points for livestock; (11) Provide incentive payments and cost-share assistance for up to 25 landowners for plantings of recommended specialty forest products in riparian buffer strips; and (12) Conduct a minimum of 5 on-farm or field day demonstrations of conservation practices and provide seminars about eligible conservation practices to 150 or more landowners.

ENVIRONMENTAL RESULTS

Water Quality Monitoring

A significant amount of historical water quality data has been collected in Tuttle Creek Lake and tributary streams and reservoirs throughout the project area and this information will be used to document the pre-project baseline water quality conditions. TWG funds will be used to collect and analyze water samples at approximately 20 stream sites during each year of the project. Parameters measured will include water temperature, dissolved oxygen, pH, conductivity, turbidity, total suspended solids, total

phosphorus, nitrate-nitrite, total kjeldahl nitrogen, E. coli bacteria or fecal coliform bacteria, and atrazine, alachlor, metolachlor, and acetochlor. Stream sites will be sampled weekly from April 1 through September 30, monthly from October 1 through March 31, and up to 10 runoff events will be sampled during the April–September timeframe. In addition, existing federal funds will be used by USACE and the Nebraska Department of Environmental Quality (NDEQ) to monitor the water quality of Tuttle Creek Lake and Swan Creek Lake (5A), respectively. Monitoring data will be assessed throughout the project period to determine if the implementation of no-till farming systems, riparian buffer strips, and other BMPs have improved water quality, reduced the number of water quality criteria violations, and reduced sediment, nutrient, herbicide, and bacteria loadings. Estimated monitoring costs are \$140,000 with TWG funds and \$20,000 with nonfederal funds over the three-year project period. A quality assurance project plan will be developed and approved prior to the collection of water quality data. All water quality data collected will be entered into the EPA Storage and Retrieval Data System (STORET).

Water Quality Modeling

The success of the Tuttle Creek Lake Interstate Targeted Watersheds Grant Project in improving water quality will be determined, in part, using the RUSLE (Revised Universal Soil Loss Equation) Watershed Model. RUSLE will be used to estimate sediment-loading reductions based on the locations and acres of buffer strips and other BMPs implemented in the project area. The estimated sediment loading reductions will be used to predict corresponding load reductions in nutrients. Local NRCS offices in Nebraska and Kansas will conduct these modeling efforts using existing funding sources.

Additional watershed modeling will be conducted by KSU using SWAT (Soil and Water Assessment Tool) and other models to predict reductions in nutrient and herbicide runoff. The KSU modeling efforts will be funded with approximately \$20,000 in TWG monies.

Installation and Adoption of BMPs

The number of landowners adopting BMPs and the number and location of the BMPs installed during the project will be tracked as measures of project success. The amounts of fertilizers and herbicides sold each year in the project area will also be tracked to determine if the adoption of BMPs has decreased the amounts sold.

PROJECT MANAGEMENT

Appendix B lists the responsibilities and experience of the project managers.

OUTREACH ACTIVITIES

- Nebraska and Kansas regional teams will solicit the participation of landowners in existing conservation programs by: (1) developing and distributing brochures about the project and available cost-share and market-based incentives for adopting conservation practices to all landowners in the project area; (2) visiting farms and ranches for one-on-one contact with landowners; (3) small group meetings; (4) large group seminars; (5) on-farm and field day demonstrations about conservation practices; (6) articles in local newspapers, farm magazines, and agricultural newsletters; and (7) radio advertising.
- KSU and NRCS will translate project successes into models such as RUSLE and SWAP and make these modeling results available to other watershed organizations.
- Members of the Nebraska and Kansas regional teams will attend the annual Targeted Watersheds Grant Conference.
- Performance and financial reports will be submitted to EPA on a quarterly basis.

APPENDIX A

BUDGET

Table 1. BUDGET INFORMATION - EPA Targeted Watersheds Grant Program¹

SECTION A - BUDGET SUMMARY					
Watershed Project, Activity or Work Plan Element			Federal	Non-Federal	Total
1. Project Management, Technical Assistance, and Outreach Activities			\$ 160,000	\$ 70,000	\$ 230,000
2. Installation of No-Till Cropping Systems and Riparian Buffer Strips			\$ 330,000	\$ 130,000	\$ 460,000
3. Installation of Other Conservation Practices			\$ 250,000	\$ 80,000	\$ 330,000
4. Water Quality Monitoring and Modeling			\$ 160,000	\$ 20,000	\$ 180,000
Totals			\$ 900,000	\$ 300,000	\$1,200,000
SECTION B - BUDGET CATEGORIES					
	Watershed Project, Activity or Work Plan Element				Total
Budget Categories	(1)	(2)	(3)	(4)	
a. Personnel	\$ 125,000	\$	\$	\$	\$ 125,000
b. Fringe Benefits	\$ 40,000	\$	\$	\$	\$ 40,000
c. Travel	\$ 30,000	\$	\$	\$	\$ 30,000
d. Equipment	\$	\$	\$	\$	\$
e. Supplies	\$ 5,000	\$	\$	\$	\$ 5,000
f. Contractual	\$ 25,000	\$ 460,000	\$ 330,000	\$ 180,000	\$ 995,000
g. Construction	\$	\$	\$	\$	\$
h. Other	\$ 5,000	\$	\$	\$	\$ 5,000
i. Total Direct Charges (sum line a-h)	\$ 230,000	\$ 460,000	\$ 330,000	\$ 180,000	\$1,200,000
j. Indirect Charges	\$	\$	\$	\$	\$
TOTALS (sum line i-j)	\$ 230,000	\$ 460,000	\$ 330,000	\$ 180,000	\$1,200,000

¹ Excerpted from Standard Form 424A, OMB Circular A-102